FEDERAL AVIATION ADMINISTRATION

National Airspace System Capital Investment Plan Fiscal Years 2007 - 2011

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Federal Aviation Administration National Airspace System Capital Investment Plan for Fiscal Years 2007–2011

1 Introduction

1.1 The Capital Investment Plan

The Federal Aviation Administration Capital Investment Plan (CIP) is a 5-year plan that describes the National Airspace System (NAS) modernization projects and the activities we intend to accomplish during that period. The CIP fulfills our obligations stated in the FY 2006 Transportation, Treasury, Judiciary, HUD and Related Agencies Appropriations Act to "… transmit to the Congress a comprehensive capital investment plan for the Federal Aviation Administration which includes funding for each budget line item for fiscal years 2007 through 2011, with total funding for each year of the plan constrained to the funding targets for those years as estimated and approved by the Office of Management and Budget."

The rapidly changing environment for air travel has made long-term planning more challenging. Airline operations dropped 13 percent in 2002 from 2000 levels as a result of the downturn brought on by September 11, 2001, but they are now returning to 2000 levels. Although growth is returning, changes in the airline industry structure are affecting the demand for air traffic services. More operations by low cost carriers with more direct flights, and the rapid expansion in regional airlines' use of turbo jet aircraft will result in a faster rate of increase in the number of operations at airports.

In the past, operations grew at a slower rate than the number of passengers carried, because a significant portion of the increase in passengers was absorbed by either using larger aircraft or flying with a higher percentage of seats filled. The trend toward increased operations is being accelerated because legacy airlines are cutting back service with their larger aircraft and shifting flights to their regional partners that provide service with smaller aircraft. The long-term upward growth trend and current industry adjustments suggest we will need more capacity to avoid an increase in delays. Modernizing the NAS is a key element in expanding capacity to accommodate the increasing demand.

The CIP projects are organized by budget line item consistent with the FY 2007 President's budget. The project funding estimates are based on several factors. For the larger projects, the estimated funding is the amount needed for known contract deliverables and associated support costs. For the projects that upgrade infrastructure, the estimated funding is either the cost for completing specific projects or the annual amounts needed to complete a systematic upgrade of existing facilities and equipment. The CIP is an important business tool because accurate financial planning stabilizes project management and cost control needed to assure success in completing and implementing on going projects for system modernization.

1.2 Strategic Planning and the CIP

Strategic plans create the core philosophy for agency management. They create a vision for the future and develop the objectives agencies use to define strategies and initiatives necessary to realize that vision. The FAA Strategic Plan is required by the Government Performance and Results Act, that requires all Federal agencies to develop a strategic plan. It identifies the most important overall agency goals in terms of the impact those goals will have on the general public. After the goals and objectives are identified, the strategic plan establishes specific performance targets to measure our level of success in meeting them.

1.2.1 The FAA Strategic Plan

The FAA strategic plan, FAA Flight Plan 2006-2010, identifies four specific goals to improve air travel and the agency's performance. The highest priorities for the FAA are:

- Increased Safety;
- Greater Capacity;
- International Leadership; and
- Organizational Excellence.

Each objective lists one or more specific actions to achieve it, and one or more measurable performance targets. We track targets and measure our performance against them to determine results.

Consistent with the President's Management Agenda, we have linked the projects in the CIP to a goal, objective, and performance target. This list of goals, objectives, and the related projects appear in Appendix A. Normally, we group several projects under a single objective and its related performance targets. This is because in a complex system, such as the air traffic control system, we need many projects to meet the objectives and their related performance targets. In addition, many projects are interdependent, and one project would not be successful in meeting the performance target without the completion of other supporting projects.

The detailed project information in Appendix B supplements the list of projects in Appendix A. Each project in Appendix B includes a Relationship to Flight Plan Goal section that explains how each project helps meet the Flight Plan goal. The section describes the contribution that the project makes toward meeting that goal, and the expected improvement in NAS services.

1.2.2 The Strategic Management Process

To supplement the broad goals of the FAA strategic plan, the Air Traffic Organization (ATO) uses the Strategic Management Process (SMP) to identify more detailed actions needed to meet Flight Plan goals and objectives. The SMP develops specific initiatives tied to four pathways. These pathways are based on the Flight Plan goals, and they guide the individual ATO service units in choosing projects that support the related performance targets. A key element in the SMP is developing metrics for each initiative so we can define and measure planned improvement in system performance.

The four pathways are:

- Achieve Operational Excellence
- Enhance Financial Discipline
- Increase Capacity Where Needed
- Ensure Viable Future

As shown in Figure 1, each of these pathways has several objectives and initiatives.

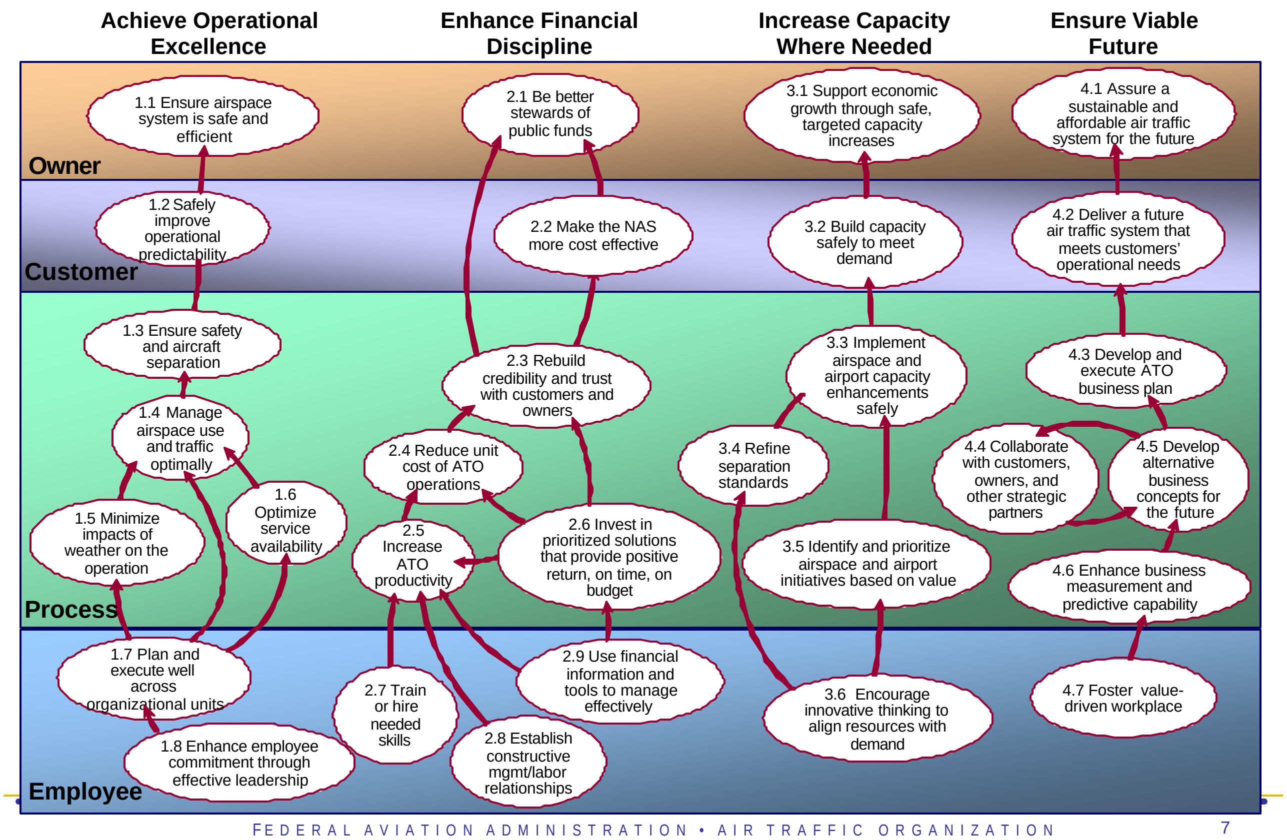

Figure 1 Strategic Management Plan Pathways

The first pathway (Achieve Operational Excellence) maintains the safe and reliable service, that the FAA provides to all our customers. This requires keeping the air traffic control system modernized and constantly seeking ways to improve safety. Given the large base of installed facilities and equipment, meeting the challenges of this pathway requires a large percentage of capital investment resources.

The second pathway (Enhance Financial Discipline) signals the transition to managing FAA more like a private sector business. It depends on accurately measuring costs, setting benchmarks for efficient performance, and making appropriate investments to reduce operating costs. This is necessary if we are to meet the challenges of future growth while controlling costs.

The third pathway (Increase Capacity Where Needed) meets the growing demands of air travel. Many large airports are nearing practical capacity and several more will reach that point within the next 10 to 20 years. While local authorities are responsible for expanding physical capacity of the airport, we must support capacity expansion and the increased complexity this will bring with investment in navigation and landing aids and improved automation.

The fourth pathway (Ensure Viable Future) relies partly on actions taken in the first three pathways, but it extends planning to the time when operations may exceed the capabilities of present systems. Managing the present system successfully is a first step in creating a solid base for expansion. Developing an accurate vision of what we need to support future levels of traffic must follow. Designing and building the system of the future relies on accurately assessing future traffic volume and on deploying equipment to handle those future operations. A sophisticated transition plan is the final step in ensuring that the air traffic system moves from its present architecture to its future form seamlessly without disrupting traffic flows.

Planned expenditures are linked to objectives and initiatives to ensure that resources are directed at identified priorities. More business-like management demands that we invest in projects with measurable returns. We are developing metrics for each objective and initiative to measure their progress. This will help ensure that projects do improve performance and deliver the intended results.

1.2.3 Next Generation Air Transportation System (NGATS)

Consistent with normal management practice, detailed planning focuses more on near-term projects to ensure that present initiatives are implemented successfully. However, as mentioned in the preceding section, aviation is changing and we have begun to develop strategies to cope with that change. The FAA has always done long-term planning, but projected growth of controller workload has emphasized our need to define a future concept of operations and develop a detailed architecture for the systems of the future. A special projects office is assessing future needs and designing the Next Generation Air Transportation System (NGATS).

The FAA reauthorization legislation, titled Vision 100 — Century of Aviation Reauthorization, required the Secretary of Transportation to establish an FAA Joint Planning and Development Office (JPDO) to manage work related to the NGATS. This office coordinates with other government agencies -- including the Departments of Defense, Homeland Security, and Commerce; the National Aeronautics and Space Administration; and the White House Office of Science and Technology Policy -- to study the needs of the future aviation system. The JPDO is evaluating future air traffic demand and the systems needed to accommodate that demand with minimal delay. It is defining the technology changes for the future and planning for the transition to newer more capable systems. To support future planning we have developed road maps that show planned modernization, which will be integrated into the Enterprise (formerly called the NAS) Architecture.

NGATS will take advantage of advanced technologies such as: Automatic Dependent Surveillance-Broadcast (ADS-B), System Wide Information Management (SWIM); Global

Positioning System (GPS) navigation; and enhanced automation systems for dynamic airspace use. ADS-B will allow a seamless surveillance picture, independent of radar locations and coverage. An airborne and space based surveillance and navigation capability based on ADS-B and GPS will break the ties to a ground based infrastructure. Once we adopt these newer systems for use in the NAS, we will need only a minimal number of back up surveillance and navigation systems.

Another aspect of the NGATS' long-term vision is sharing common knowledge of traffic situations to allow decision making when, where, and by whomever needs to make those decisions. We need to build a common set of information so we can use an internet-like network to make information accessible, usable, and secure in real time for everyone involved. We need to be able to communicate with each aircraft individually. Aircraft can then be contacted by any air traffic control (ATC) facility regardless of where the aircraft or the facility is. Beyond the five years covered by the CIP, automation systems will converge on a common platform, which will provide a base for new tools to evaluate airspace and to allocate workload.

Over the coming decade, the NGATS plan will include a concept for removing the geographical limitations of air traffic control facilities by using communications and automation to share air traffic information nationwide. The controllers' focus would shift from controlling individual flights to selecting options for the best use of the airspace for all the flights under their control. Instead of static facility assignments and daily flow planning to manage the demand, the ATO will dynamically apply resources to areas of high demand. Using dynamic airspace allocation, controllers can be assigned to support high traffic areas on an hour-by-hour basis, so the daily staffing can be optimized across the entire system. This initiative will support ATC workforce planning, by allowing the projected growth in traffic to be handled within the present workforce levels.

By 2022, we expect that NGATS investments will create a system that can handle twice the traffic of today. This will provide capacity benefits by spreading workload to avoid limitations associated with present airspace sector allocations. Projects that begin the NGATS effort, such as ADS-B and the SWIM are included in this CIP.

1.3 Important Factors Affecting Planning for the Future

1.3.1 Air Travel Demand

The demand for air travel is closely correlated to changes in the economy. The economy has grown in 2005, and economic growth is forecast to continue in 2006. Even with the significant fluctuations in fuel prices, inflation appears to be under control, and travel demand is returning to the growth trends of previous years. Last year's FAA aerospace forecast showed a favorable long-term economic forecast with an average annual Gross Domestic Product (GDP) growth of 3.2 percent for the next 12 years. Figure 2 below shows the historical growth in one component of air traffic workload over the 20 years, 1985 to 2004. The trend has been steadily upward even though there are short-term deviations from the overall trend line.

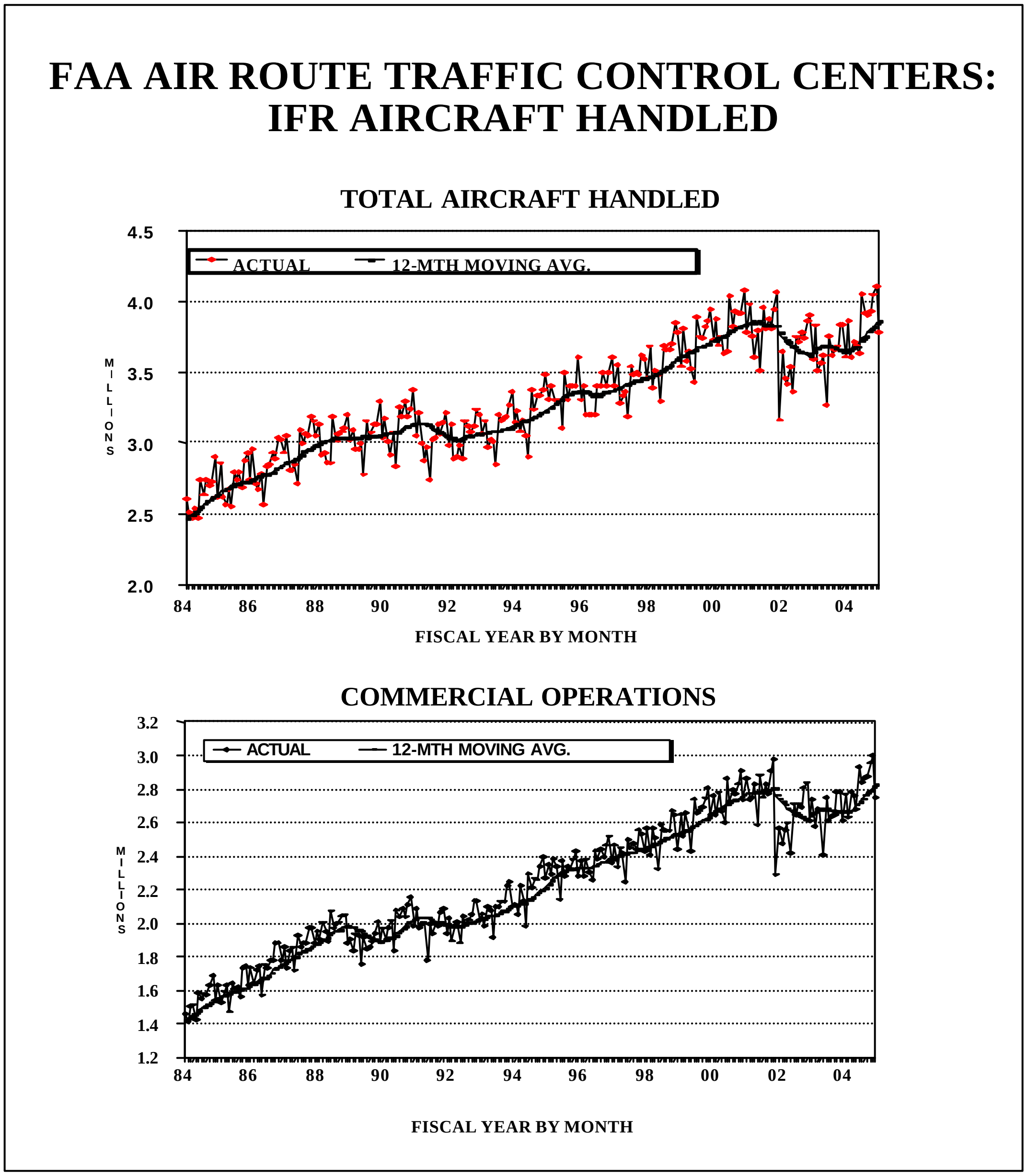

Figure 2 Instrument Flight Rules (IFR) Aircraft Handled by En Route Centers

1.3.2 Air Traffic Workload Growth

A significant driver of future workload growth is the increase in the ratio of operations to passengers carried. Low-cost and regional carriers now have a 43 percent share of the air travel market. Regional jets represent 37 percent of the traffic at the nation's 35 busiest airports. These aircraft carry fewer than 100 passengers. Because of this trend, we expect the growth in air traffic workload will be faster than it was in previous years.

1.3.3 Growth in En Route Operations

Last year's aviation forecast predicted operations handled by en route facilities (Air Route Traffic Control Centers) would grow 2.2 percent per year over the next 12 years. This sounds like fairly modest growth, but it translates to about 25 percent growth over the 12 years of the forecast. In the long term, this growth will create significant pressure on the air traffic control system and make it more difficult to accommodate the requests for efficient routes and altitudes that reduce operating costs for commercial operators. The increasing demand on the system, coupled with the complexity of introducing new technology at multiple locations creates significant challenges in modernizing the NAS.

Figure 3 shows the number of annual operations and the growth trend rate for both en route and terminal operations.

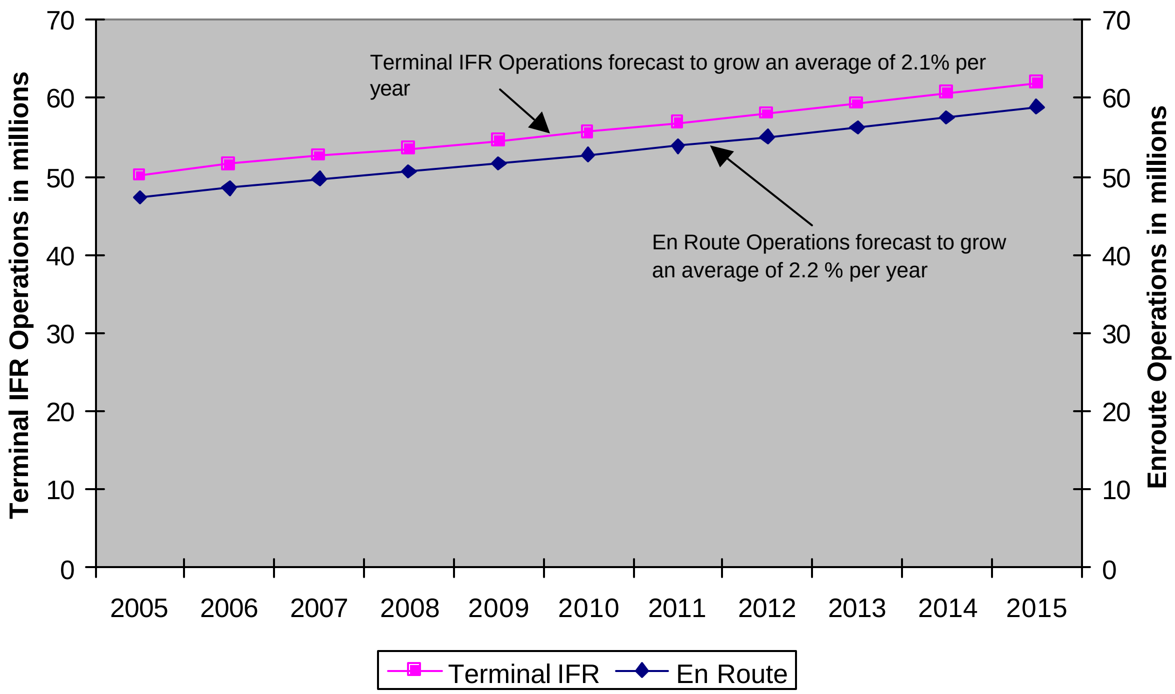

Figure 3 Growth Trends in Aircraft Operations

1.3.4 Growth in Terminal Operations

As shown in Figure 3, the 2005 forecast also estimated that instrument operations at airports would grow at an average rate of 2.1 percent per year over the next twelve years. Instrument operations are the most significant gauge of the workload at terminal facilities. This forecast growth in instrument operations is more noteworthy than the numbers might indicate. The top 35 airports, many of which are currently operating near capacity, handle 73 percent of aviation passengers and a significant percentage of instrument operations. Growth in operations at the predicted rate at these hub airports will translate into increased delays unless capacity is increased. The major portion of the capacity increase must come from new runways. Eight new runways were commissioned over the period 2000 to 2005. The Operational Evolution Plan shows that at least seven more are planned to become operational by 2010.

Runways are constructed by airport authorities, and local financing for that construction is supplemented by grants from the Airport Improvement Program. However, it is important to note that these new runways require significant capital investment. Often airspace around the airports is reconfigured to accommodate a new runway, and that requires new navigational aids and precision landing systems. An additional expense related to the precision landing systems is the approach lights and visibility sensors. Capital investment may also be required to expand air traffic control facilities and add additional controller positions to handle the increased complexity of terminal airspace. The FAA must support these infrastructure investments to support capacity expansion, at the same time it is investing to improve its own efficiency by upgrading automation, communication, navigation, and surveillance systems to reduce maintenance costs and control obsolescence.

2 Allocating Capital Investment Among Competing Demands

To develop the budget, we use priority rankings based on economic analysis coupled with risk assessment and the project's support of Flight Plan goals. Because safety is FAA's primary mission, safety projects receive the highest priority. Projects that improve internal operational efficiency are also a high priority, because we need to control operating costs. Projects that reduce operating costs for aviation users must be balanced against the projects that improve internal efficiency. Analyzing and understanding the economic trade-offs between user benefits and internal benefits is essential in achieving a credible balance in allocating capital investment funds.

2.1 Maintaining Current Capacity

The FAA has a large base of installed equipment. We allocate a significant portion of capital investment to keep equipment updated so we can sustain high levels of reliability. Many facilities are operating near peak levels most of the day. We cannot allow present systems to deteriorate while designing and building new ones. If delays increase while we are developing and installing new equipment, the cost to users can be in the millions of dollars.

Because existing systems with electronic components have a finite life, we must upgrade them. Several factors contribute to the short life of automated air traffic control equipment. Electronic parts operate at high temperatures, and eventually they become weakened by successive heating and cooling cycles. Also, since technology continues to evolve, hardware and peripherals becomes obsolete at a rapid rate, and it becomes difficult to find spare parts to repair them. Obsolescence also makes it difficult to modify existing systems, because components designed for newer systems are not compatible with existing ones. Replacement needs create a challenge for FAA in balancing replacement costs with the costs of adopting newer, more capable technologies, which would allow us to reengineer the techniques used for air traffic control.

2.2 Controlling the Cost of Operations

Operating costs have increased at an average annual growth rate of 6.2 percent since 1996. We have taken preliminary steps to address this cost growth. In FY 2004, we decreased overall employment in the ATO by 3.7 percent and have taken steps to reduce maintenance costs. We are introducing cost measurement and cost reduction targets to measure progress in reducing costs further. The following projects are examples of initiatives to reduce the cost of operations for the FAA.

2.2.1 Federal Telecommunications Infrastructure (FTI)

The Federal Telecommunications Infrastructure contract provides commercial telecommunications services to support both voice and data communications at FAA operating facilities and to and from FAA headquarters. This contract uses an integrated approach to improve delivery of services. Costly legacy networks will be replaced by modern, reliable, and consolidated network infrastructure incorporating multi-service and multi-media capabilities at low cost.

2.2.2 Distance Learning

The Distance Learning Program enables us to train FAA employees at their workplace using computer based instruction rather than bringing them to the FAA Academy in Oklahoma City. Employees can take courses at their worksite and use interactive media to learn about new equipment and procedures being introduced into the NAS. The major economic benefit of distance learning is that it eliminates part of our costs for student travel and per diem by minimizing the number of employees who have to take resident training. In addition, distance learning increases training opportunities for FAA employees and increases their productivity by minimizing their time away from work.

2.2.3 Energy Cost Savings

The Energy Policy Act of 2005 established a goal for all Federal agencies to reduce their consumption of energy by 2 percent yearly for the ten-year period 2006 to 2015. To reach that goal the FAA/ATO Energy Management Program will adopt energy efficient technologies and provide more precise information on energy consumption to facility managers. Energy efficient lights and fixtures will replace existing lights at 100 facilities. Thermal barriers will be installed to reduce heating or cooling losses from 125 terminal buildings in areas with temperature extremes. Occupancy sensors coupled with automatic controls will reduce unnecessary use of heating, ventilation and air conditioning (HVAC) systems and lights at 25 facilities. Improving how we meter energy consumption will give facility managers more exact information on how energy is being used in their facility, and it will help them find how best to reduce energy consumption. The program is also installing clean and renewable power sources at 150 facilities. Currently we have four wind turbines, 50 solar panels, and seven fuel cells providing electric power. We will continue to install these new power sources. They will reduce dependence on the commercial power grid where grid power is undependable or very costly and improve facility security.

2.2.4 Competitive Sourcing

This program examined the most effective way to provide flight services to aviation users. Savings from contracting out the flight services function are projected to total $2.2 billion over 13 years. In FY 2006, FAA will complete the flight service station transition and explore other areas where it may be more cost-effective to contract for services.

2.2.5 Restructuring the Air Traffic Control (ATC) System

We are studying other potential avenues for controlling costs in the future. One possibility would be to reduce the number of air traffic control facilities or consolidate some automation functions to reduce operating costs. There are 20 en route centers and over 500 terminal facilities in the contiguous 48 states. We are studying whether other configurations of ATC facilities or reducing the number of these facilities would improve productivity and save operating costs. We need to address important issues such as: where to locate the remaining facilities; whether a nearby facility could back up one with an equipment failure; and the differences in savings between equipment consolidation and facility consolidation.

3 Safety and Security

This section will highlight some of the FAA's safety and security capital programs. Most of the projects in the Capital Investment Plan (CIP) support air traffic control functions, but there are several capital projects included in the CIP that support the FAA's safety mission. The monitoring and enforcement of safety standards remains with the FAA, and these activities are not part of the ATO mission. Safety projects include upgrading and improving databases of safety and aircraft design information. These databases help safety inspectors allocate their inspection hours to the most serious problems, and they are a ready source of regulatory data and past actions taken by the FAA to improve safety. Other safety projects include weather systems that enable controllers to warn pilots of severe weather problems and upgrades for inspection aircraft that check the accuracy of navigational aids and precision landing systems.

Responsibility for regulating airport security has shifted to the Department of Homeland Security, but we must maintain and improve our internal security. The air traffic control system is part of the nation's critical infrastructure, and we must protect it from damage and disruption. We must ensure both physical security of structures and equipment and information security for computer systems. We must also maintain back up systems for continuity of operations during natural disasters and human efforts to disrupt system operations. This includes secure facilities and emergency radio networks to maintain operational control when normal systems are unusable.

3.1 Aviation Safety Projects

The following projects represent some of the most important safety initiatives supported by capital investment.

3.1.1 Safety Databases

The Aviation Safety Analysis System (ASAS) and its two follow-on projects—the System Approach for Safety Oversight (SASO) and the Aviation System Knowledge Management Environment (ASKME)—are safety databases that provide information to aviation safety inspectors. These databases contain records of safety infractions by pilots and air carriers; safety regulations governing how to operate, manufacture, and repair aircraft; and directives and compliance records for commercial operators. Having this information readily available ensures that the FAA safety inspectors are aware of the past safety compliance of the people and organizations they are reviewing. It also increases the effectiveness of these inspectors and ensures that they have the latest information about FAA regulations and Advisory Circulars when they conduct inspections.

3.1.2 Safe Flight 21

The Safe Flight 21 program has been testing new operational concepts in Alaska that improve both safety and efficiency. Using automatic dependent surveillance (a surveillance technique that requires the aircraft to radio its position to a ground system) and ground based transmitters, we have been able to provide better services to aircraft even though Alaska has much less ground infrastructure than more populous states. Automatic dependent surveillance provides positive air traffic control for areas beyond the coverage of existing radars. This allows more precise separation of aircraft. It has also been used to find a downed aircraft quickly and save a pilot's life. The ground based transmitters have been used to transfer weather, air traffic and terrain information to the cockpit to help pilots avoid hazards and choose safe flight paths when they need to deviate from planned routes because of severe weather.

3.1.3 Runway Incursion Reduction Program

The Runway Incursion Reduction Program investigates technology that can help prevent runway incursions. Runway status lights are one of the technologies that have been tested. These lights give pilots signals similar to a traffic light. One of the signals tells them not to enter or cross an active runway. Another tells them that it is safe to proceed. Other technologies explored by this program include using bar coding to determine the best way to keep controllers informed of an aircraft's position on the airport's surface. As new and better techniques are developed to warn of potential runway incursions, they can move from development and testing to implementation.

The systems that are developed in this project will supplement the Airport Surface Detection Equipment (ASDE) that is discussed in the roadmap sections. The ASDE-3 is a radar-based system that displays the location of aircraft on or near the runway and ground vehicles that could pose a hazard so controllers can issue warnings to prevent a runway or taxiway accident. The ASDE-X uses a variety of technologies to provide the same information. Both support FAA efforts to reduce runway incursions and prevent accidents.

3.1.4 Weather Systems

We discuss these systems in the weather roadmap section, but we mention them here also, because most weather sensors help improve the safety of flight. The Terminal Doppler Weather radar, Weather Systems Processor, and the Low Level Wind Shear Alerting System all provide warnings of dangerous wind shear conditions to help pilots avoid flying into hazardous weather. Visibility sensors measure the distance pilots can see on a runway so that they know whether visibility is above or below the minimums needed for a safe landing at the airports where they intend to land. The weather sensing and reporting systems are integrated to produce weather forecasts so flights can be routed around severe weather and avoid turbulence and thunderstorm risks.

3.2 Security

There are several programs to protect FAA facilities and equipment and to prevent injury to employees and damage and disruption of air traffic control systems. The major projects are discussed below.

3.2.1 Facility Security Risk Management

Standards for facility security have become more rigorous in the past four years. The Department of Homeland Security, in conjunction with the General Services Administration has issued guidelines for improving the security of government buildings. We have analyzed all our facilities to determine if we are in compliance with these guidelines. We will upgrade existing buildings to meet the standards that apply, and will design new buildings with appropriate security safeguards, including set backs from roads, improved perimeter fencing, and more modern surveillance systems to prevent physical intrusion. The FAA plans to complete certification of existing buildings by the end of FY 2009. There will be an on going program after that to continually improve physical security as facilities are modernized or relocated. We must protect employees and critical equipment so we can keep operating during disasters and disruptions.

3.2.2 Information Security

The FAA must protect the NAS from both external and internal cyber threats. The number of incidents has been reasonably small so far, but the critical nature of FAA's infrastructure requires elaborate security precautions to prevent intrusions. As FAA has moved from proprietary software to using commercial off-the-shelf software, our vulnerability to hacking has increased. As part of our existing information technology security program, we are working to strengthen the firewalls that prevent intrusion and to upgrade anti-virus software and other safeguards.

It is essential that information security be included in the design of new equipment. It is substantially easier to design these features into a new system than to add them after the system is operational. The Office of the Chief Information Officer will develop requirements for new system design and issue certification for those systems that comply. We are also working on adaptive quarantine, which allows information systems to isolate any components affected by a virus or worm until the system is safe to use. Presidential Directive/HSPD-12 sets the policy for a common identification standard and mandates government-wide implementation of secure and reliable forms of both physical and logical identification. The FAA must develop and integrate enterprise-wide access control services. The Office of the Chief Information Officer is responsible for developing the logical access portion of the HSPD-12 requirement.

3.2.3 Emergency Communications

In case of natural disasters or human caused disruptions to services, the FAA must maintain communications among its facilities. The NAS Recovery Communications (RCOM) project provides an emergency communications network using high frequency radio. It also provides secure communications for voice and facsimile messages. Mobile communications devices are provided for short-range communications. We are continually upgrading and testing these systems so that they will work when they are needed.

4 Enterprise Architecture: A Guide for Migration to the System of the Future

Office of Management and Budget policy requires all Federal agencies to produce a detailed enterprise architecture describing the information technology systems they use and their plans for future improvements or replacements. The FAA enterprise architecture provides a clear picture of the complete set of systems used in present and future air traffic control facilities. The FAA can use it to analyze opportunities to standardize and coordinate our use of these systems. Developing the enterprise architecture requires a disciplined approach in identifying current systems and projecting how they will evolve. It defines the data transfers between systems and the exchange protocols. It also encourages standardizing hardware and software, so systems operate more efficiently and we can perform our missions more productively.

4.1 The FAA Enterprise Architecture

The FAA has prepared a system architecture for several years, so we have a solid base for an enterprise architecture. The existing NAS architecture contains a description of the current systems and plans for how to configure the future air traffic control system. The new enterprise architecture will add information to the existing base to serve a broader group of executives and system developers. It will contain several views of the system from executive to operational. These views are layered, with detail increasing from the lower numbered views to the higher numbered ones. We will also have a disciplined process for updating these views. Keeping data in the enterprise architecture current is essential to making it usable throughout the organization.

4.2 Roadmaps to the Future System

The detailed roadmaps shown in the following sections are an integral part of the enterprise architecture. These roadmaps show the progression from the present system to the infrastructure needed to support the system of the future. The roadmaps reflect long-range planning that extends beyond the five-year period covered in the CIP. The roadmaps will ensure an orderly transition to the Next Generation Air Transportation System (NGATS). Modernization will occur in incremental steps, but it is important to show the beginning and ending configurations so changes are synchronized for all the functions portrayed in the roadmaps.

Modernization shown in the roadmaps is based on creating a system that can handle future demand. We conducted a systematic review of what changes would support expected future levels of air traffic based on the assumption that current technology was not adequate. Many of the enhancements will take place after 2011.

4.2.1 Automation

The FAA uses automation for several purposes. The initial en route automation systems were installed in the 1970s and updated in the late 1990s. They help controllers by presenting information on their displays as well as depicting aircraft position. They show aircraft identification, speed, altitude and whether the aircraft is level, climbing or descending. They also provide maps with information on routes, restricted areas, and several other fixed features of the controller's sector. The terminal automation systems installed and upgraded since the 1970s provide similar information for the controllers handling aircraft approaching or departing airports. Automation also supports many functions that are essential to controlling air traffic such as showing the data from weather sensors, giving the status of runway lights and navigational aids, and printing flight plans. System capacity would be substantially less without these automation aids.

The automation roadmap shown in Figure 4, depicts systems that we are using in 2006 and the progression to more capable systems over the planning period. One of the important future year changes shown in the roadmap is reducing the number of automation systems by consolidating functions in larger shared systems. We are installing some of the new systems shown; but, for some projects, the roadmaps show conceptual changes that are still in the planning stages.

Automation Roadmap

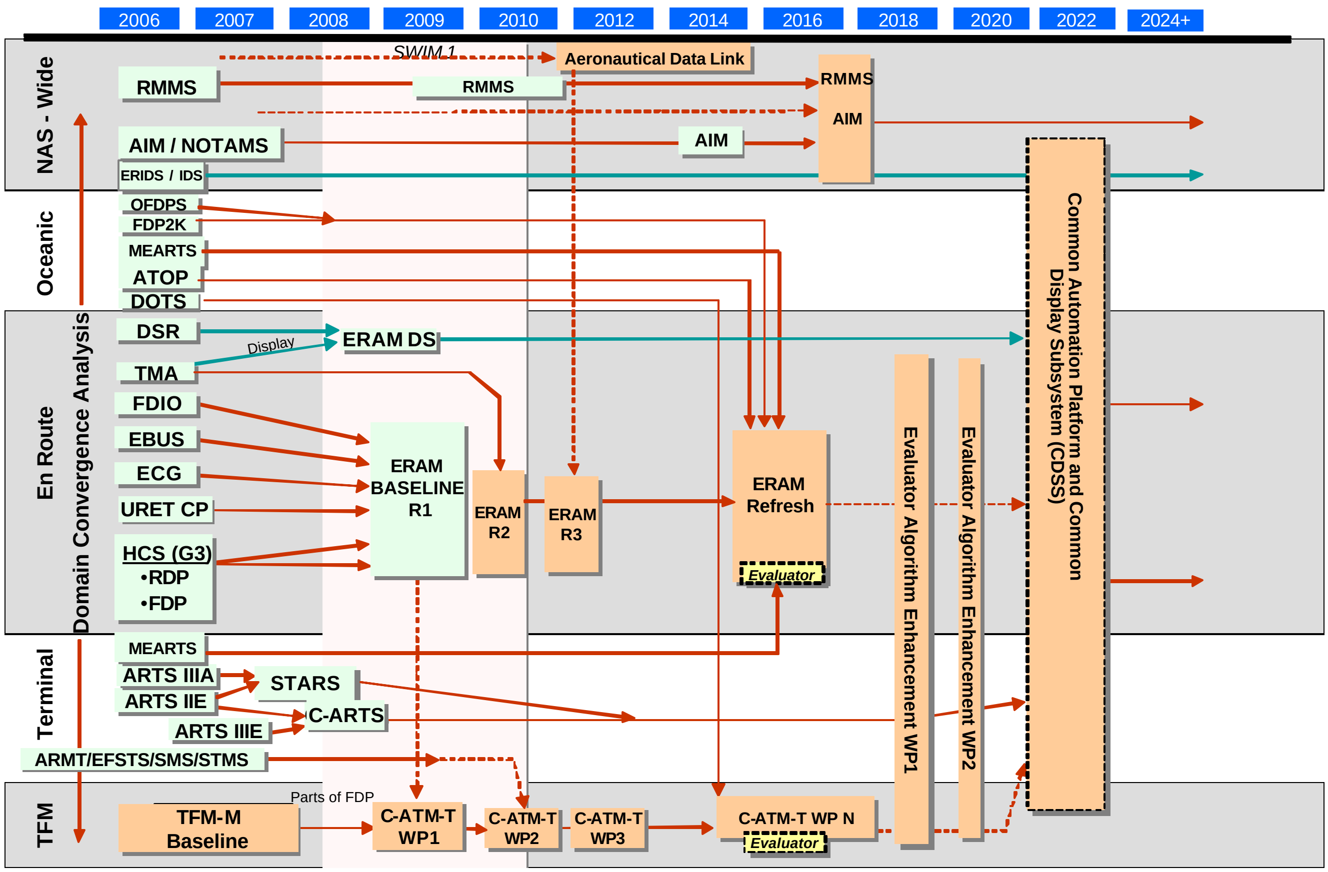

Figure 4 Automation Roadmap

Figure 5 shows the projected CIP expenditures on automation roadmap projects.

FAA future budget projections are not released to the public.

Figure 5 Expenditures in the Automation Functional Area

There are several information systems that provide relevant information to air traffic facilities. The Notices to Airmen (NOTAMs) system provides status information on runways and other infrastructure to inform pilots of runway closures, status of navigation aids and flight restrictions. The Remote Maintenance Monitoring System (RMMS), which is part of the NAS Infrastructure Management System (NIMS), provides equipment operational status information to maintenance personnel. These systems will use the System Wide Information Management (SWIM) system to share data beginning about 2009.

Many parts of the current en route system are being replaced under the larger En Route Automation Modernization (ERAM) program. Some of the early stages of the replacement program are complete. We have replaced the original back up system, which sustains operations if the main en route automation system fails, with a system called EBUS (en route back up system). A support computer system, which formats radar data and flight information for the main en route computer (called the Host Computer System), has been replaced by the En Route Communications Gateway (ECG) and is now operational.

We are replacing en route systems for several reasons. The displays we use now are out of production, and their failure rates are increasing. The automation software is written in an obsolete language, which cannot be ported from the Host Computer System (HCS) to the next generation of computers. The existing system cannot dynamically process changes in flight plans, and it will not support the most advanced traffic management tools we need to handle the expected growth in air traffic demand.

ERAM is a large program, with an estimated capital cost of about $2.2 billion; but the FAA Investment Analysis, completed in 2004, estimated that it would yield $8.8 billion in benefits. The benefits come mainly from avoided maintenance costs and increases in the number of aircraft that can use the same segment of airspace simultaneously. Replacing the hardware and software will reduce maintenance costs by $1.8 billion. User benefits of $5.3 billion result from improved operating efficiency because ERAM will allow faster processing of route requests and in flight route changes. The remaining $1.7 billion in benefits comes from safety improvements and reduced FAA staffing from converting paper processes to electronic information systems.

As the roadmap shows, we have started planning for a Common Automation Platform that we can use for both en route and terminal air traffic. The system would use common processors, and there would be a seamless transition from terminal to en route and back to terminal. This system would also share information with the System Wide Information Management (SWIM) system, which would collect and share data with facilities that are part of the air traffic control system and with authorized users.

Automation systems used in the terminal environment are a mix of the Automated Radar Terminal System (ARTS) models II and III, and the Standard Terminal Automation Replacement System (STARS). There are about 170 terminal automation systems currently in place, and about 50 are STARS. The Stars program is currently approved to install 9 additional systems. The FAA is studying several options for terminal automation. We have deferred full replacement of the ARTS with STARS until we complete further analysis on the benefits of collocating terminal facilities.

The Advanced Technology and Oceanic Procedures (ATOP) system for oceanic air traffic control is fully operational at New York and Oakland. The third, at Anchorage, Alaska, should become operational in spring 2006. The ATOP equipment is expected to remain in service until 2022. ATOP provides controllers a more precise display of aircraft position, which allows reduced separation of aircraft flying over the oceans. Reduced separation results in more aircraft receiving the most fuel-efficient altitudes and routes. The most recent update of benefits prepared by the integrated product team estimates total user benefits of $2.6 billion.

The Traffic Flow Management (TFM) hardware and software is installed at traffic management units at the centers and large terminal control facilities. These units coordinate with the Air Traffic Control System Command Center (ATCSCC) in Herndon, Virginia to manage traffic flows across the NAS. The TFM advanced software tracks aircraft under positive control and calculates the anticipated demand on system capacity with present and future levels of operations. It also relies on detailed weather forecasts to predict delays, and, if necessary, to help choose the best routes to avoid severe weather. A key for success of the system is cooperation with airspace users. The ATCSCC is in contact with airline operations centers and shares information with users to reach agreement on the best way to avoid delays.

4.2.2 Communications

Communications is essential to air traffic control. Radio, ground telecommunications lines and satellite links connect pilots with controllers and provide interfacility and intrafacility communications. Voice switches in air traffic facilities allow controllers to select the channels they need to communicate with one another and with pilots. Radios in these facilities and those at remote locations, that extend the range of communication beyond the limits of direct radio transmission, are connected to the voice switches. Emergency systems provide communications when the primary systems fail.

There is a limited band of frequencies assigned for air traffic communications. As the volume of traffic increases, the number of frequencies available limits our flexibility to add control sectors. There are several solutions to expanding the number of channels available. We are waiting for industry agreement on the most suitable technology for handling future growth and the expanding levels of information exchange needed to maintain efficient operations in the future.

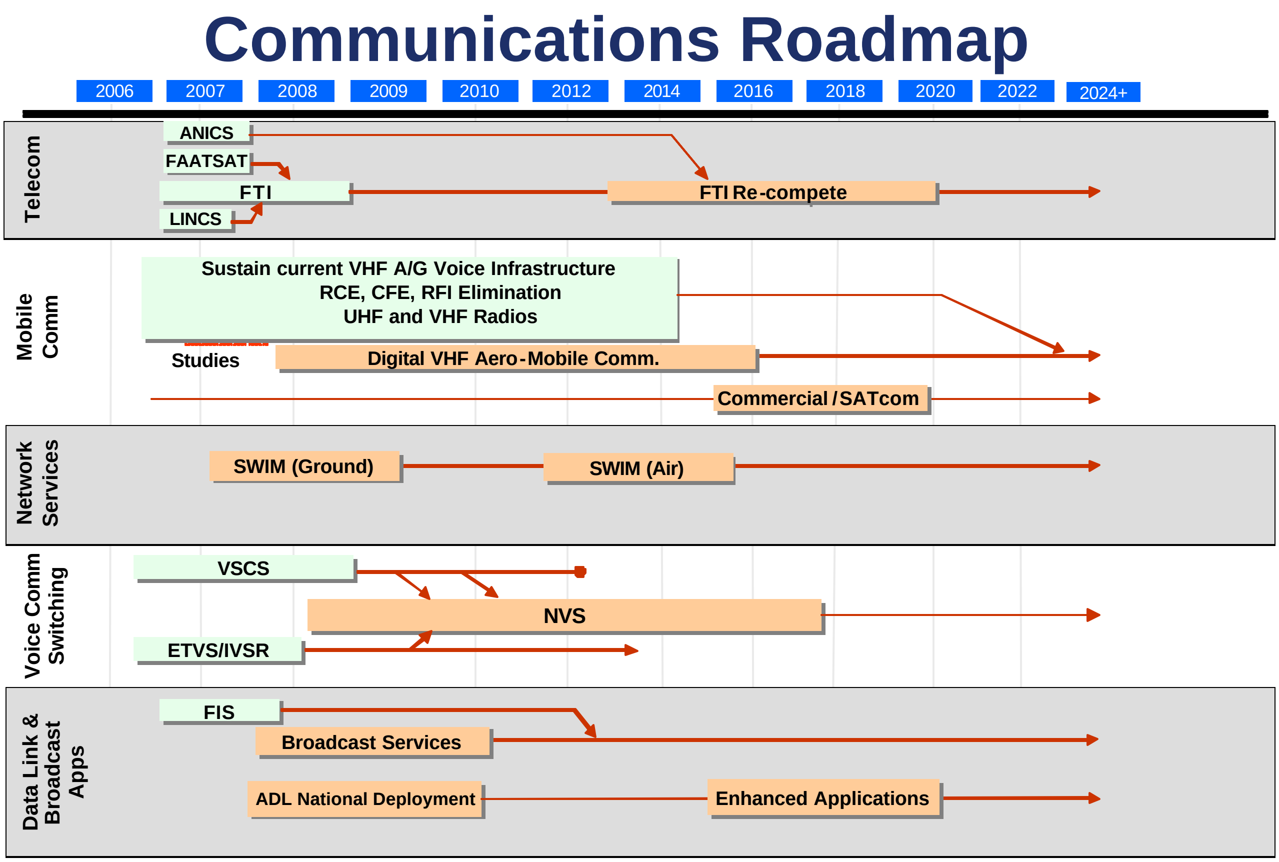

Figure 6 Communications Roadmap

Figure 7 shows the projected CIP spending for replacing communications systems and improving and modernizing communication channels.

FAA future budget projections are not released to the public.

Figure 7 Expenditures in the Communication Functional Area

The FAA relies on commercial telecommunications companies to provide links between its facilities and to transfer messages from remote radio sites to control facilities. The FAA contracts with a communications provider to provide the land and satellite communications links to connect headquarters and field facilities. These telecommunications lines carry both operational and administrative messages. The recent single contract awarded through the FAA Telecommunications Infrastructure (FTI) program reduces costs and allows a higher level of security and accountability for internal users of telecommunications services.

As shown in Figure 6, the FAA has large voice switches in the en route centers that controllers use to choose the best lines to communicate with pilots, other controllers in their own facility, and controllers in nearby facilities. This includes radio communications that are routed to the centers from remote radio facilities, because en route facilities control aircraft that may be 300 miles or more away. This is beyond the range for direct radio communication. Because of increasing maintenance costs on the current switches, we must replace some components to maintain system reliability. The program for component replacement is called the Voice Switching and Control System (VSCS) Technical Refresh. In future years, we will begin replacing the VSCS with the NAS voice switch. We will design this new switch so we can use it in both en route and terminal facilities. It will be a flexible design that can be built to the right size for the facilities using it. Standardizing switches reduces training, maintenance and spare parts costs.

The terminal facilities also rely on voice switches so controllers can communicate with aircraft and controllers in other facilities. These switches are less elaborate, but they must operate at the same high reliability as the large switches in the centers. We have purchased three sizes of these switches and replaced many of the older terminal switches. By 2009, we plan to begin developing the NAS voice switch to replace existing terminal switches as they reach the end of their service life.

Most existing aircraft radios have a single channel on each frequency for voice communication. Since the allocated radio frequency bands are already being used, we cannot rely on obtaining additional frequencies to increase the number of channels for communication. One technique to provide more capacity, which is currently used internationally, is further dividing the frequency band around the nominal frequency. Modern radios are more sensitive and can use a narrower frequency band with little interference, but there are limits to this technology. A second approach is to provide more channels on each available frequency by sharing use of the frequency through message timing and sequencing. The FAA is buying radios with this capability, which can also support the existing single channel radios commonly in use. There is an international study underway by ICAO (International Civil Aviation Organization) to determine which new technology should eventually be adopted. International carriers should agree by 2015. The new technology cannot be used until compatible equipment is installed in aircraft.

Commercial airlines make extensive use of data link for communications between aircraft and airline operations centers. The ATO has an experimental program to test how data link would work for transmission of routine air traffic control messages. We are not considering using data link for immediate communications to pilots giving heading, altitude and other air traffic direct changes. There are many advantages to data link, including eliminating pilot read back errors when they confirm clearance information with controllers, and reducing controller workload. In addition, the data link would allow the pilot and controller to exchange more information. We will decide whether to implement data link in 2008. Implementation will depend on users equipping their aircraft with compatible equipment.

We plan to continue funding smaller communications programs, upgrading and modernizing systems when necessary. We will continue to upgrade and relocate remote receive and transmit stations that extend the range of radio communications with pilots to meet changing flight patterns. We have installed a satellite communications system in Alaska, because it has less ground telecommunications infrastructure than more densely populated states, and this system will be modernized.

We will continue to upgrade and relocate remote receive and transmit stations that extend the range of radio communications with pilots to meet changing flight patterns.

4.2.3 Surveillance

To provide separation services to aircraft, air traffic controllers must have an accurate display of all aircraft under their control. Controller displays use radar and transponder information to show the location of aircraft and portray flight data. Terminal facilities use several models of the Airport Surveillance Radar (ASR). These radars use reflected electromagnetic energy to show aircraft location. The primary information used by controllers is provided by another technology called the beacon interrogator. This system sends a signal to aircraft equipped with a transponder. The transponder sends a reply, which gives the aircraft call sign, altitude and speed and allows the beacon interrogator to determine its position.

In the en route environment, similar systems are used to detect aircraft position. Air Route Surveillance Radars (ARSR) are the long range radars that provide position information using reflected energy, and Air Traffic Control Beacon Interrogators (ATCBI) send signals that aircraft respond to with position information and data identifying the aircraft, speed, and altitude.

There are two systems used on the airport surface. The Airport Surface Detection Equipment (ASDE) provides a display of aircraft and ground vehicles in the airport operating areas (runways and taxiways) and helps controllers manage aircraft on the ground to prevent runway incursions. There are two ASDE models, the ASDE-3, which relies on radar surveillance, and the ASDE-X, which uses various technologies to achieve the same purpose.

The Precision Runway Monitor (PRM) uses rapid-update radar to provide the accuracy controllers need to handle simultaneous parallel approaches on closely spaced runways.

Figure 8 is the roadmap for surveillance systems.

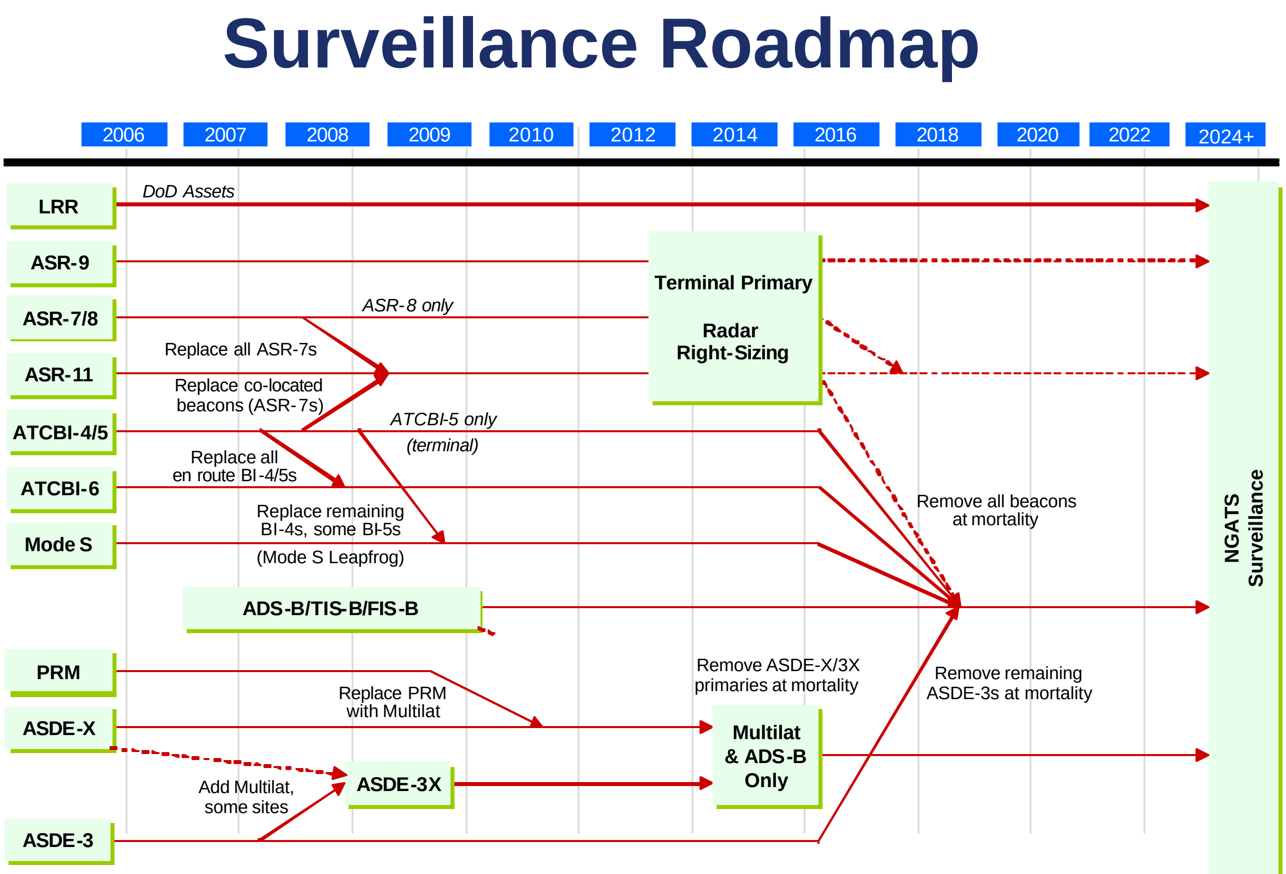

Figure 8 Surveillance Roadmap

Figure 9 shows the CIP costs associated with upgrading the surveillance units.

FAA future budget projections are not released to the public.

Figure 9 Expenditures in the Surveillance Functional Area

The ASR-9 radars installed at airports will remain in service at least through 2017 and possibly longer. Most of these radars were installed in the 1990s, and they are undergoing a service life extension program over the next several years. The older ASR-7s are being replaced by the ASR-11. Terminal radars are designed to display traffic within 60 miles of the airport, and these primary radars are more critical in the terminal areas. Smaller aircraft that do not have a transponder and do not fly under positive control in low altitude airspace outside the terminal control areas could stray into controlled airspace and not be detected without primary radar. Replacing these radars depends on future facility configuration studies. Plans do not call for the long-range primary radars to be replaced, but they will remain in service and receive service life extension upgrades as necessary.

Many of the older beacon interrogators were upgraded by the Mode-S system. The Mode-S system can address aircraft individually rather than just send out a signal that triggers all aircraft transponders. Also, the Mode-S aircraft transponder sends information to other aircraft, whose collision avoidance systems calculate the relative position of the transmitting aircraft and warns pilots when aircraft are too close. The Air Traffic Control Beacon Interrogator Model 6 (ATCBI-6) program will replace the older en route airspace beacon interrogators. These systems are the primary surveillance systems for air traffic control. Information transmitted by aircraft transponders is processed to show aircraft position, identification, and flight data on controllers' displays to help them be more precise in ensuring aircraft separation. We will decommission the Mode-S and ATCBI-6, when Automatic Dependent Surveillance systems are fully operational.

The ASDE-X surveillance systems have been installed at 10 airports, and a total of 35 systems will be operational by 2011. They will remain in service until Automatic Dependent Surveillance systems are fully operational. They use a triangulation technique to locate and display the position of aircraft both in the air approaching runways and on the ground. They also detect the location of ground vehicles in the operations area near the runways and taxiways.

The Precision Runway Monitor (PRM) has been installed at five airports. It is used at airports with closely spaced parallel runways to increase capacity during marginal weather conditions. The PRM systems use rapid update radars and special displays so controllers have precise location information to ensure separation of aircraft making simultaneous approaches to two closely spaced parallel runways. Controllers can maintain a safe margin of separation because the frequent updates allow them to detect deviations from the approach path in time to warn pilots. PRM allows both runways to be used to full capacity rather than having to reduce airport arrivals during low visibility conditions and use staggered approaches.

The FAA is beginning to use a new technology for showing the location of aircraft. Automatic Dependent Surveillance-Broadcast (ADS-B) relies on a radio signal transmitted from an aircraft to report the position determined by its navigation system. This concept has been tested successfully in low traffic density airspace, and it has been shown to be effective. It is especially valuable in areas with poor or no radar coverage.

In existing applications of ADS-B, the navigation system in the aircraft reports its position based on signals from the satellite system called GPS (Global Positioning System). This is a system of 24 satellites orbiting the earth. Each satellite provides a signal, and navigation receivers process signals from three or more satellites to calculate a precise (less than 50 feet of error) position. Ground stations installed at several locations receive aircraft ADS-B messages and relay the information to air traffic control facilities. The position information appears on air traffic controller displays. The ADS-B ground-based transmitters can also broadcast information to the cockpit. During testing in Alaska, we provided weather, traffic, and terrain information to pilots by data link to improve safety. Significant future work is necessary before ADS-B can be adopted for widespread use. Using ADS-B could reduce the need for beacon interrogators. Reducing the number of beacon systems would reduce maintenance and avoid a portion of future replacement costs.

4.2.4 Navigation

There are two major categories of ground navigational aids, en route and precision approach and landing systems. Radio navigation aids guide pilots in en route flight. Precision landing guidance system and associated equipment enable pilots to land in limited visibility. The primary en route system is the Very High Frequency Omnidirectional Radio Range with Distance Measuring Equipment (VOR and DME). There are over 1,000 VORs spread across the United States. In addition to providing position information, these navigational aids are used to define airways, which are based on the straight lines from VOR to VOR. These routes provide structure for the air traffic control system. They help controllers predict the future flight path of aircraft. En route navigation aids allow pilots to know their location when they cannot see the ground. The precision landing aids, called Instrument Landing Systems (ILS), guide pilots to runway ends in very limited visibility. There are over 1,000 ILS installed in the United States. They are essential to airlines for maintaining schedule reliability during poor weather. Figure 10 shows the roadmap for navigation aids.

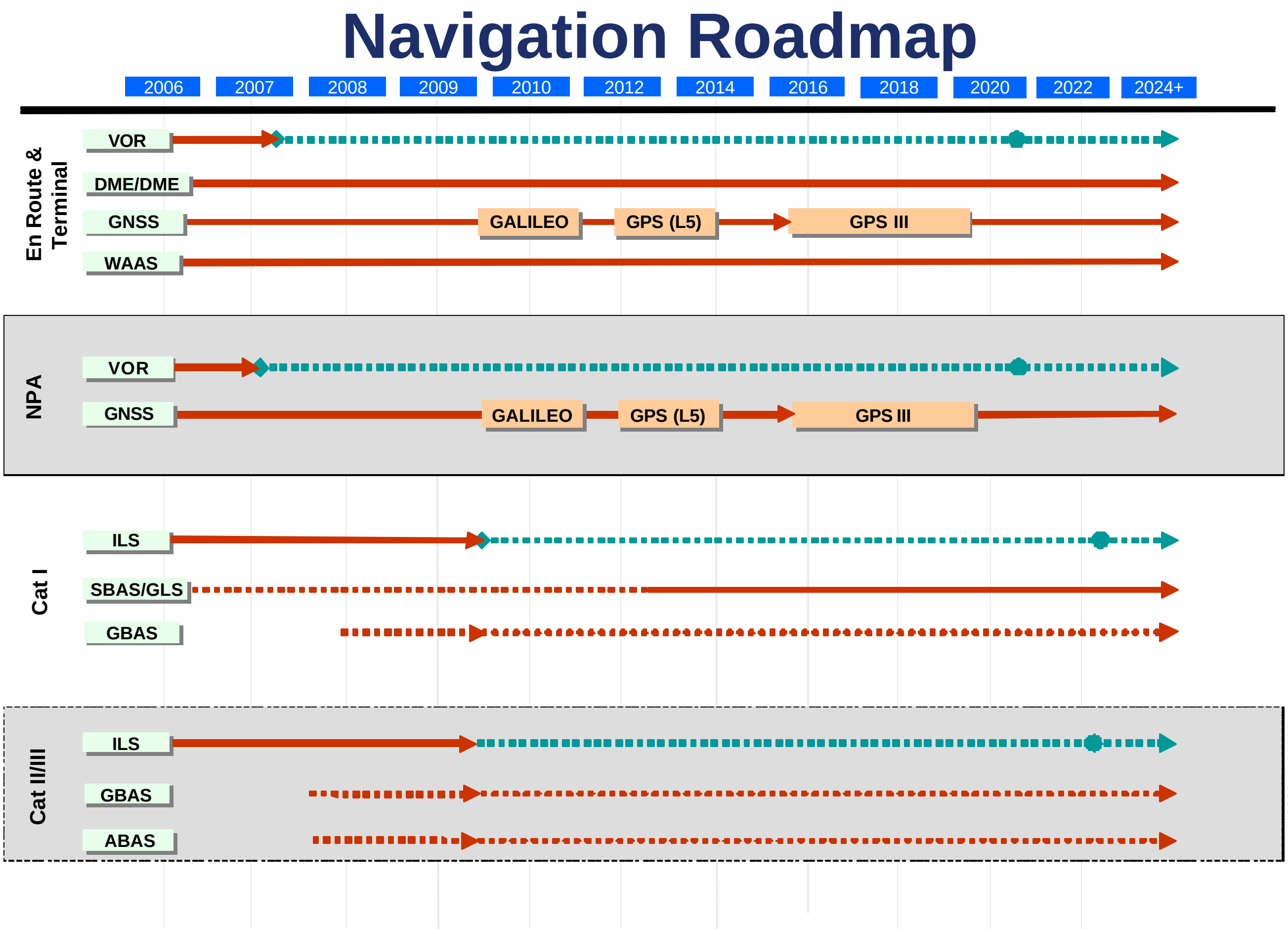

Figure 10 Navigation Roadmap

Figure 11 shows the future capital investments for navigation systems included in the CIP.

FAA future budget projections are not released to the public.

Figure 11 Expenditures in the Navigation Functional Area

Present plans call for a reduction from 1,000 VORs to about 500 systems, which is the minimum operational network. Reducing the VOR/DMEs to 500 assumes that GPS will come into broader use within the NAS, and the remaining VORs will serve as a back up for GPS. Pilots need back ups because some aircraft will not be equipped with GPS navigation receivers, and occasionally GPS cannot provide an accurate fix. Back up navigation systems are also needed in case of a GPS failure, either loss of the signal or failure of the aircraft equipment that receives and processes that signal.

The FAA is installing low power DMEs near airports to support recommendations of the Civil Aviation Safety Team to provide improved precision landing guidance to aircraft. As part of that program, the DME will replace a portion of the outer markers used with the Instrument Landing Systems. The outer markers provide a signal to the pilot as his aircraft passes over a fixed point on approach to an airport to verify that the aircraft is on the proper glide slope for landing.

There are over 1000 Instrument Landing Systems (ILS) currently in operation. We install a limited number of new ILSs every year to provide precision approaches to newly constructed runways and to provide approach guidance at existing runways which qualify because of increased operations. Precision approaches supported by GPS augmented with Wide Area Augmentation System or Local Area Augmentation System corrections may eventually replace some ILSs; however, the technology has not reached the stage where these approaches can be used in place of an ILS. We will maintain the existing and newly installed ILSs over the period covered by the roadmap.

An ILS requires several other supporting systems to be usable for precision approaches. Runway lights and approach lights must be installed to support ILS installed at new runways. Runways with precision approach guidance also have visibility detectors that measure visibility on the runway, so pilots know whether it is above minimum visual requirements for an ILS approach. Existing lighting and visibility systems associated with ILS must be maintained and upgraded.

4.2.5 Weather Systems

Weather information is essential to aviation. Pilots need to know the effect winds aloft will have on their speed; whether or not there will be sufficient visibility for them to land at their destination airport; and whether severe weather will affect the flight. Thunderstorms and turbulence can damage aircraft and cause injuries to passengers. The FAA has a significant role in collecting weather data and distributing it and National Weather Service information to aviators.

There are two major categories of weather information systems. The first is the weather sensors that measure several atmospheric parameters including: temperature, wind speed and direction, relative humidity, and cloud heights. Sensors provide real time information to air traffic facilities and to centralized weather forecasting systems. The second category of weather systems is the weather display systems, which process weather data and provide visual representations of weather patterns. An advanced feature of some systems is that they project the future movement of weather affecting operations. The first weather roadmap (Figure 12) shows the current and planned status of weather sensors.

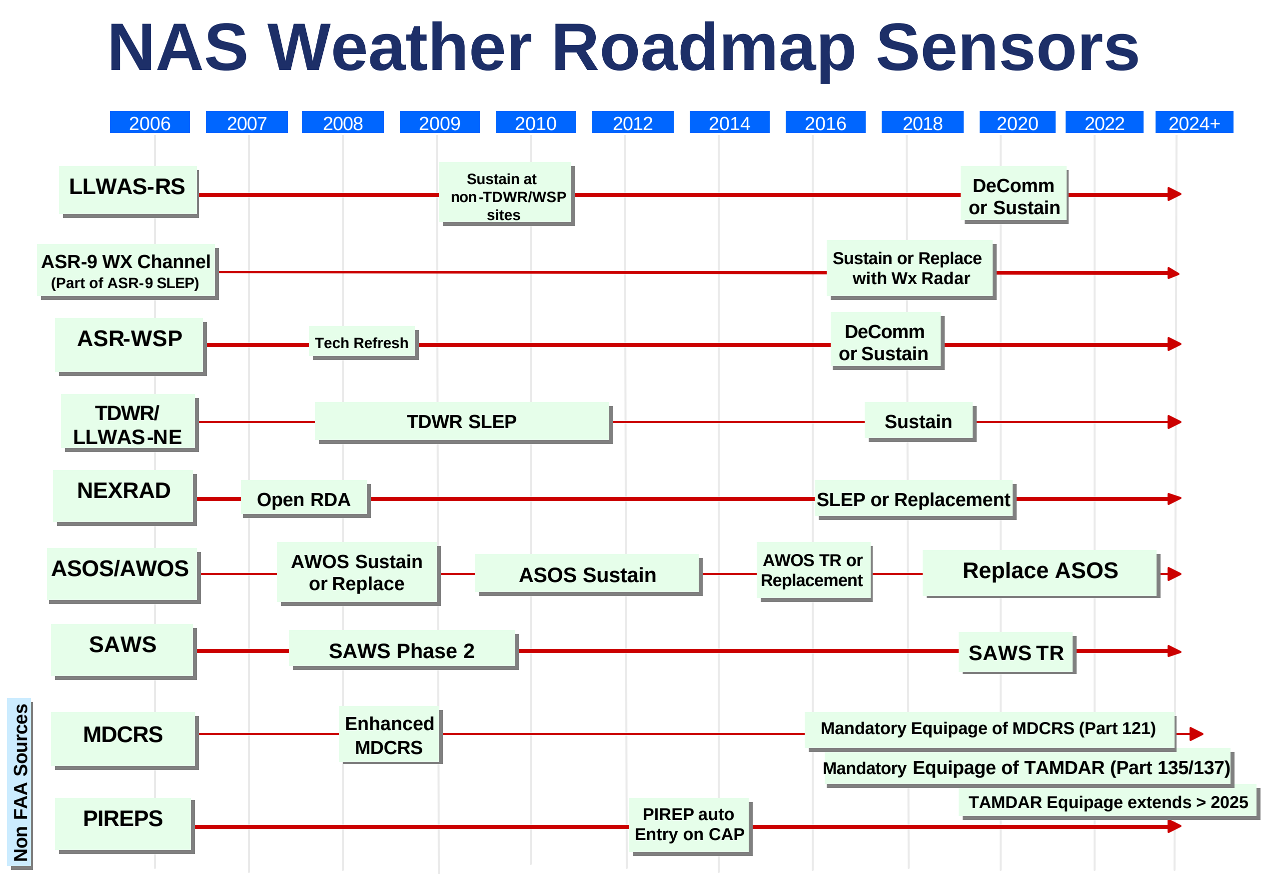

Figure 12 Weather Sensor Roadmap

There are three different sensors that detect wind shear, which is a significant hazard to landing aircraft. The most sophisticated is the Terminal Doppler Weather Radar (TDWR). There are 47 of these radars and most are located about 10 miles from a runway end. Using Doppler technology, the radars can detect the rapid changes in wind speed and direction that increase hazards for an aircraft approaching a runway. For medium-sized airports, a lower cost alternative is the Weather System Processor (WSP), which interprets data from the terminal surveillance radar to identify wind shear. To supplement these radar systems, there are wind sensors that measure wind direction and velocity at six to ten points around the runways. The wind sensors and the associated computer systems that determine whether there are significant changes in the wind at different locations near the airport are called the Low-Level Wind Shear Alerting System (LLWAS). The LLWAS serve locations that do not have radar as well as locations where they supplement the radars with point specific wind measurements to verify the location of any existing wind shears. The roadmap shows that all these vital safety systems will remain in place through the planning period, but all will need modernization to control maintenance costs and maintain availability.

The Automated Surface Observing Systems (ASOS) and other variants such as the Automated Weather Observing System (AWOS) and the Stand Alone Weather Sensing (SAWS) system, have up to 14 sensors that measure weather data. These systems feed data directly to air traffic control facilities and support automated broadcast of weather information to pilots. They also provide regular updates for the forecast models that predict future weather problems. These sensors will remain in operation and will be upgraded to sustain and improve the quality of weather observations. Snow and ice can affect the accuracy of observations, and there are several improvements to these systems that can minimize the effect of ice and snow.

The Meteorological Data Collection and Reporting System (MDCRS) and other non-FAA systems collect data from aircraft in flight. The winds and humidity at high altitudes are very useful for forecasting movement and intensity of weather systems. Sensors on the aircraft measure the outside air temperatures and water content of the atmosphere and combine that information with the wind computed in the aircraft navigation system and radio this information to the ground stations. Using aircraft to report weather expands the number of observations available to meteorologists and improves their forecasts.

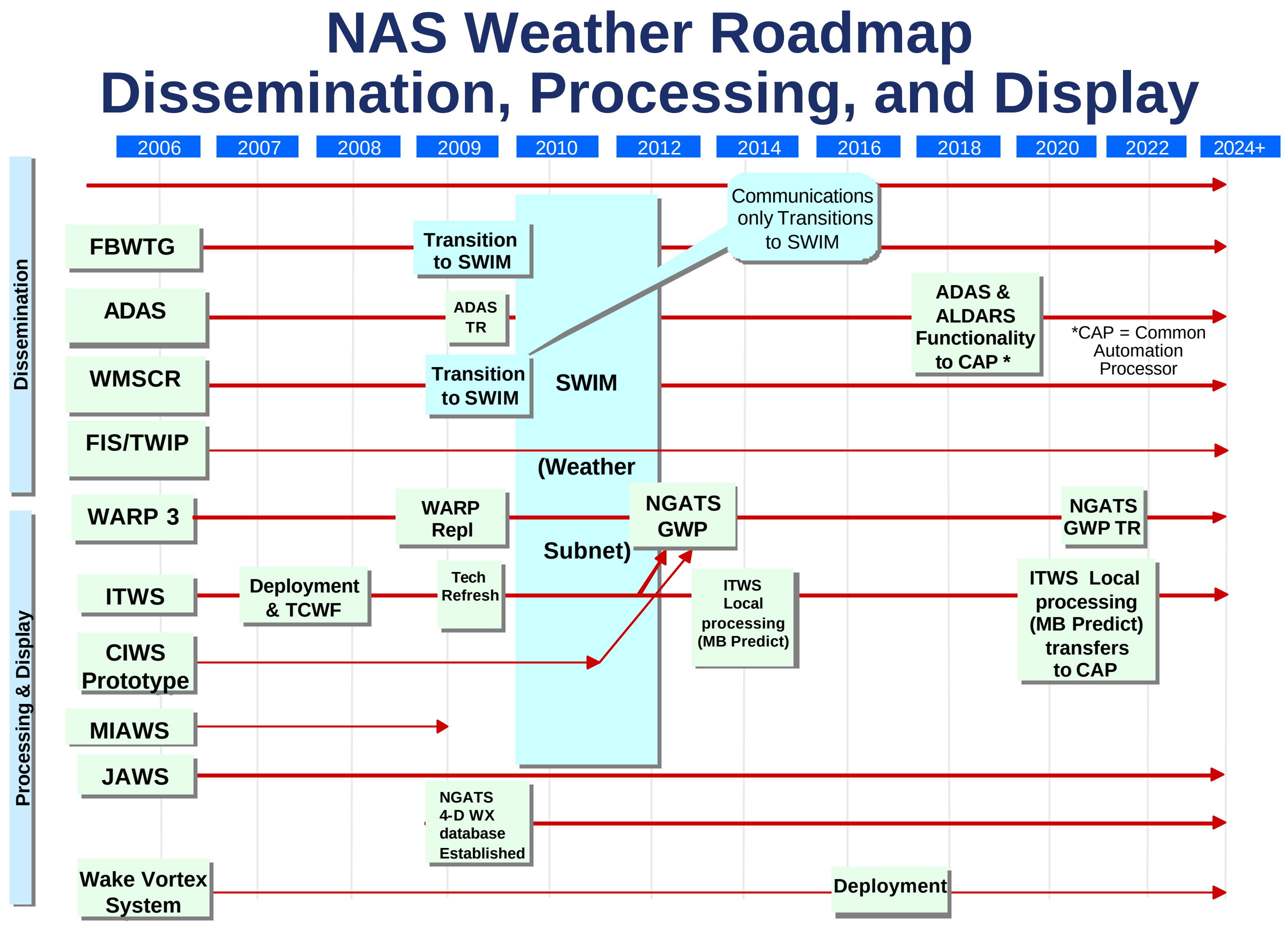

Figure 13 Weather Dissemination, Processing and Display Roadmap

Figure 14 shows the planned expenditures included in the CIP for weather sensors and weather dissemination and processing systems.

FAA future budget projections are not released to the public.

Figure 14 Expenditures in the Weather Functional Area

Weather distribution and display systems consolidate weather information and send it to the National Weather Service and air traffic computer systems. Weather display systems compile radar data and other observations to produce a visual display of weather location, including color-coded information on the intensity of any severe weather. The weather information can also be shown on controllers' displays and at various weather forecaster workstations. It provides an immediate picture of the current weather and the data for forecasting the future location and intensity of weather systems.

The Weather and Radar Processor (WARP) used in en route control facilities gets its information from the National Weather Service's Next Generation Weather Radars (NEXRAD); from automated weather sensors located at airports; and from other sources such as weather satellites. It compiles the information for interpretation by the Center Weather Service Unit forecasting stations. Planning has begun to modernize the existing WARP processors, which are becoming obsolete.

The central weather distribution facilities called the Weather Message Switching Centers (WMSCR) must be maintained until the ATO transitions to the System Wide Information Management (SWIM) network. The two WMSCR facilities collect weather data and transmit it to FAA operational facilities. The FBWTG (FAA Bulk Weather Telecommunications Gateway) is a similar link between the National Weather Service and the Air Traffic Control System Command Center. Since weather information is time critical, these facilities must function in near real time and have high reliability to ensure important weather information reaches the en route and terminal facilities that will be impacted.

The AWOS Data Acquisition Service (ADAS) radio links transmit weather data from automated sensors to FAA facilities. These radio links will eventually transmit data to SWIM. We plan to upgrade this system in 2010.

The Integrated Terminal Weather System (ITWS) consolidates weather information from automated sensors and surrounding radars to provide real time weather information for terminal control facilities. The system also projects movement of severe weather systems up to 20 minutes into the future. Tower and Terminal Radar Approach Control (TRACON) controllers use the information to make more precise estimates of when runways should be closed and subsequently reopened. They also use the information to plan for a switch in terminal arrival patterns to avoid excessive maneuvering as aircraft approach an airport. The ITWS will be installed at 22 airports.

We are developing two enhancements to weather systems, but we have not decided whether to implement them. The Corridor Integrated Weather System (CIWS) portrays weather along busy corridors between major cities and helps controllers recommend altitudes and flight paths that help pilots avoid severe weather. The Medium Intensity Airport Weather System (MIAWS) is a weather radar processor that displays enhanced weather data at medium activity airports. It is less expensive than TDWR or WSP, and it uses data from NEXRAD radars to improve prediction of weather hazards for airports that do not qualify for TDWR or WSP. In 2006 we will decide whether to deploy these systems.

4.3.6 Facilities

The ATO has thousands of manned and unmanned facilities, which we must modernize regularly. The largest facilities are the 20 en route centers, which house hundreds of employees. The centers also house the equipment needed to control aircraft flying in the en route airspace between terminal control areas. The other operational facilities with significant staffing are the over 500 tower and TRACON facilities that control traffic departing and arriving at airports. There are also several thousand unmanned facilities that contain radar equipment, remote communication links, and navigational aids. We need significant funding to upgrade older facilities and replace facilities that are damaged.

At the en route centers, automation equipment is continually being upgraded, and the centers must be renovated to accept the new equipment. Another major program replaces the electrical power generating and conditioning equipment that ensures that power surges do not damage the sensitive electronic equipment. Back up generators provide electrical power if commercial power is lost. Major renovations include upgrading heating and air-conditioning systems and replacing roofs. We expect to spend at a level consistent with previous years to keep these facilities modernized.

Between $100 and $200 million is spent annually to construct new towers and renovate existing towers and terminal radar control (TRACON) facilities. As airports grow and build new runways and hangers, the old towers no longer have clear sight lines to the operating area, and we need to build new taller towers. When the number of controller workstations is increased to accommodate increased traffic, many towers and TRACONs do not have adequate interior space to handle the new equipment and controller positions necessary to manage the air traffic at that facility. This can require either a new facility or extensive modernization. As with the centers, there are several towers at which we need to modernize infrastructure such as heating and air conditioning systems and elevators.

The FAA is evaluating potential avenues for controlling facility costs in the future. One possibility would be to optimize the network of air traffic control facilities. It may be feasible to reduce the number of facilities or consolidate some automation functions, so operating costs can be reduced. Studies are underway to determine if alternative configurations of air traffic facilities or reducing the number of facilities would improve productivity and save operating costs.

There are several navigation and surveillance systems installed on and in the area near the larger airports. They are linked to the tower and maintenance workstations by airport cable loops. These loops provide operating status of the systems and allow adjustments to be made from the control facilities. Because they are buried in the ground, the cables deteriorate and need to be replaced. We are replacing them with optical fiber, which has more capacity and a longer life.

Figure 15 shows the planned expenditures for facilities projects that contribute to modernizing the air traffic control system.

FAA future budget projections are not released to the public.

Figure 15 Expenditures in the Facilities Functional Area

4.2.7 Support Contracts and ATO Employee Costs

The FAA budgets in a single line item for the costs of its employee who support capital investment programs. These employees supervise installing new equipment, maintain documentation, test new equipment, and perform support functions for capital investment. These costs are budgeted on an annual basis at the request of Congress to avoid large unobligated balances that would occur if they were included in project funding requests. This work is essential for successfully implementing new and upgraded equipment. On-site engineers and technicians ensure that the equipment is installed properly and that installation doesn't interfere with on-going air traffic control functions. Documentation improves efficiency when making repairs or upgrades and reduces the time spent planning for future modernization.

The FAA has several support contracts that help our employees plan modernization of existing systems; manage the transition to new equipment; and oversee the installation of that new equipment. The System Engineering and Technical Assistance (SETA) and the Center for Advanced Aviation System Development (CAASD) contracts help us plan modernization and simulate the impact on air traffic of implementing new concepts and new equipment. The Technical Services Support Contract (TSSC) provides field engineers that oversee the site preparation for and installation of new equipment. These engineers and technicians help the FAA keep installation on schedule for the many projects with equipment deliveries. The National Implementation Support Contract (NISC) helps plan our transition to new equipment. Partly this requires developing detailed schedules for preparing facilities to receive new equipment and partly it's developing the engineering drawings to depict physical changes in electrical wiring, plumbing, and physical layout for the new equipment. Since air traffic control functions must continue during the transition, we must plan carefully to have preliminary steps fully completed before installation begins so we minimize any disruption as we transition to new critical control equipment.

Another category of support contracts covers leasing, modifying or modernizing buildings to house engineering and training functions. FAA also leases or purchases computer automation to assist those engineering functions. Examples include leases for the Mike Monroney Aeronautical Center and licenses for software used for the William J. Hughes Technical Center. Also needed is the support contract to provide spectrum engineering to allocate radio frequencies and to prevent interference with existing frequencies. These projects help sustain the infrastructure for testing new equipment and help to analyze system needs and develop the system of the future. We also have environmental projects to remove asbestos, improve fire/life safety, prevent fuel tanks from leaking and clean up environmental pollution.

Figure 16 shows the planned expenditures for the specific mission support projects that will help us modernize the air traffic control system.

FAA future budget projections are not released to the public.

Figure 16 Expenditures in the Mission Support Functional Area

5 Conclusion

Although there have been short periods of decline in air travel and the aviation operations that support that travel, the long-term trend for operations has been up, and we expect growth to continue. Growth will put pressure on the capacity at large airports, and it will require more runways and more sophisticated management of air traffic activity. We will need new and better equipment and procedures to accommodate the anticipated growth. Capital investment will play an important role in modernizing the NAS, so we can make new capacity available.

Annual business planning addresses the near-term considerations and the immediate steps necessary to accommodate growth. The Joint Planning and Development Office (JPDO) will develop the long-term vision for the future configuration of the air traffic control system. Near-term capital investment will address immediate needs, but continued support for capital improvements will be essential to ensure a smooth transition to the JPDO architecture and prepare the NAS for the future.

In the future we will have to balance investment between projects to add capacity and projects to reduce operating costs. New capacity is needed, but operating costs must also be reduced. This Capital Investment Plan shows the steps needed to both expand capacity to handle future travel demand and modernize facilities and equipment to control costs.

As the roadmaps show, we must make a large, coordinated effort to build a system that can handle future air travel demand and prevent increases in delays. We have begun work on some of the initiatives, but several important steps follow. Continuing to enhance the collaborative air traffic management technology program will improve the interaction between commercial carriers and the FAA and help reduce delays. The SWIM program will help us share information so those decisions will be more informed with real time information on system status. Introducing Automatic Dependent Surveillance and data link communication will improve efficiency and reduce workload. It will take these initial efforts and a continuing commitment to modernization to achieve the goal of building a system able to handle future growth. This CIP provides the roadmaps that define the more capable system envisioned and the systematic changes needed to implement the individual components of that system.

6 Appendices to the Capital Investment Plan

The CIP contains four appendices:

Appendix A
- Lists FAA strategic goals, objectives, and performance targets
- Associates CIP projects with strategic objectives and performance targets

Appendix B
- Provides CIP project descriptions and relationship of project to strategic goals
- Lists FY 2007–2011 — Performance Output goals
- Shows System Implementation Schedules

Appendix C
- Provides estimated expenditures 2007–2011 by Budget Line Item (BLI)

Appendix D
- Defines acronyms and abbreviations